Medical-Care Expenditures Attributable to Cigarette Smoking During Pregnancy — United States, 1995

An estimated 26% of women of reproductive age (i.e., 18–44 years) smoked in 1993 (*1*), and approximately 19%–27% of women smoke during pregnancy (*2,3*). Smoking during pregnancy is causally associated with an annual estimated 32,000–61,000 low-birthweight infants and 14,000–26,000 admissions to neonatal intensive-care units (*3*). The estimated smoking-attributable direct medical-care costs for chronic conditions in 1993 were $50.0 billion (*4*); however, this estimate omitted the direct medical costs of tobacco exposure for infants and children and most of these costs for pregnant women. To derive 1995 estimates of the smoking-attributable costs for direct medical expenditures (i.e., inpatient, physician, hospital outpatient, and emergency department costs) related to pregnancy outcomes, the University of California at Berkeley and CDC analyzed data from the 1987 National Medical Expenditures Survey (NMES-2). This report summarizes the findings, which indicate substantial smoking-attributable direct medical expenditures for pregnant women and newborns.

The NMES-2 is managed by the Agency for Health Care Policy and Research and is a population-based longitudinal survey of the civilian, noninstitutionalized U.S. population (*5*). The data are nationally representative and provide cost estimates based on amounts paid by all insurers and by persons paying out-of-pocket for health care. During February 1987–May 1988, data were obtained through a questionnaire administered to a cohort of 35,000 persons in 14,000 households during personal interviews. Of those initially screened, 80% participated in NMES-2. Data were collected about socioeconomic factors, health insurance coverage, use of medical care, and medical-care expenditures. The Medical Provider Use and Expenditure Survey, one supplement of NMES-2, confirmed self-reported medical-care costs and provided information about costs that survey respondents were unable to report. The Adult Self-Administered Questionnaire Household Survey (ASAQHS), also a supplement to NMES-2, provided data about self-reported health status and health-risk behaviors (e.g., smoking, safety-belt use, and obesity). The NMES-2 data indicated that health-care costs for respondents to the smoking question in ASAQHS were lower than those for nonrespondents, indicating response bias. The Heckman two-stage statistical approach (*6*) was used to adjust the data.

In this analysis, never smokers were compared with current smokers. Never smokers were defined as persons who smoked <100 cigarettes during their lifetimes, and current smokers, as persons who smoked ≥100 cigarettes during their lifetimes and who smoked at the time of the interview. Respondents to NMES-2 who were pregnant during 1987 were categorized by pregnancy outcome: miscarriage or stillbirth, uncomplicated birth, or complicated birth. A complicated birth was one for which the respondent indicated that the delivery had not been normal or the provider indicated the mother or the infant had been hospitalized under a diagnosis code indicating pregnancy complications (e.g., hemorrhage from placenta previa, maternal infection, fetal distress, or malposition of the fetus). Using multivariate analyses, the probability of each of these pregnancy outcomes and the expected expenditures for each were estimated based on sociodemographic factors (i.e., region of residence, age, race/ethnicity, income categories, marital status, education level, and insurance coverage), receipt and timing of prenatal care, and smoking status.

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Analysis of the 1987 data indicated that the probabilities of miscarriage or stillbirth (0.23) and complicated birth (0.25) were the same for smokers and nonsmokers. The estimated expenditure for an uncomplicated birth also was the same for smokers and nonsmokers—$3805 in 1987 dollars. However, the estimated cost of a complicated birth in 1987 was significantly higher for smokers than for nonsmokers ($10,894 versus $6544; $p<0.01$).

When extrapolated to the nation, the medical-care expenditures attributable to smokers with complicated births was an estimated $791 million in 1987 dollars, representing 11% of the total medical expenditures for all complicated births ($7 billion). These national estimates of smoking-attributable costs for complicated births were derived by using the probability of having a complicated birth (0.25), the number of live-born infants in 1987 (3.8 million) (*7*), an estimated smoking prevalence during pregnancy of 19%, and the smoking-attributable difference in the expected expenditures for complicated births determined from NMES-2. When a smoking prevalence during pregnancy of 27% (*3*) was used in the calculation, the estimated smoking-attributable costs were $1.1 billion (15%).

The smoking-attributable costs of complicated births were updated to 1995 by accounting for medical-care cost inflation* and the number of live-born infants in 1995 (3.9 million) (*7*). The total smoking-attributable costs were an estimated $1.4 billion (11% of costs for all complicated births) in 1995 dollars, based on a smoking prevalence during pregnancy of 19%, and an estimated $2.0 billion (15%), based on a smoking prevalence of 27%.

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Editorial Note: The findings in this report underscore the substantial and preventable economic impact of complicated births among smokers on the medical-care system in the United States: in 1987, the estimated direct medical cost of a complicated birth for a smoker was 66% higher than that for nonsmokers. Despite the magnitude of this difference, in this analysis, three factors probably resulted in underestimates of the smoking-attributable costs associated with pregnancy and delivery during 1987. First, in contrast to previously published reports (*3*), this analysis did not establish a positive relation between smoking during pregnancy and the probability of miscarriage and stillbirth or complicated births; this finding may reflect the small NMES-2 sample of births for which all data were available (n=490). Second, the smoking-attributable costs in this report did not include costs associated with the transfers of newborns to other hospitals or readmissions during the first year of life for medical conditions associated with smoking during pregnancy. Finally, the indirect costs related to infant mortality (e.g., years of productive life lost) and to maternal or infant morbidity (e.g., days lost at work) were excluded from this analysis.

The 1995 estimate of smoking-attributable costs also omits these costs. In addition, the precision of the 1995 estimate is affected by whether the probability of having a complicated birth increased or decreased during 1987–1995 and by changes in medical treatment patterns. For example, if complicated births were treated more inten-

*Adjustments for inflation were calculated using the medical services component of the Consumer Price Index.

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sively (i.e., with costlier medical technologies) in 1995 than in 1987, the methodology used to project 1995 expenditures probably would underestimate the 1995 smoking-attributable costs of complicated births.

The finding that the costs of complicated births for smokers exceeded those for nonsmokers may reflect greater severity of complications and, therefore, more intense treatment (e.g., longer hospital stays for the mother, more neonatal intensive-care unit days for the infant, and greater use of specialists as well as other personnel). Further analysis is needed to clarify the specific sources of these differences.

Smoking-cessation programs are an important strategy for preventing the adverse outcomes and related costs of smoking during pregnancy. For example, a meta-analysis of randomized trials of prenatal smoking-cessation programs using biochemical validation indicated a 50% increase in cessation over usual practice (*8*). Despite the effectiveness of this approach, many health-care providers do not offer such programs. To reduce smoking during pregnancy, patients must be more effectively educated about the health consequences of smoking during pregnancy both for them (e.g., placental complications) and for their unborn children (e.g., low birthweight), and health-care providers should be encouraged to provide this information (*9*). CDC is collaborating with a Robert Wood Johnson Foundation national program (Smoke-Free Families: Innovations to Stop Smoking During and Beyond Pregnancy), which supports the efforts of 10 grantees to develop, test, and evaluate innovative programs to assist childbearing-aged women in quitting smoking before, during, and after pregnancy and to maintain a smoke-free environment for their children.

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